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ABSTRACT

Although policy makers have expressed interest in expenditures by private elementary and secondary schools, nationally representative data in this area are not available. In the absence of expenditure data it may nevertheless be possible to derive national estimates of total expenditures by private schools indirectly, by using the information that some associations of private schools collect from their members. Data on expenditures are routinely collected by three major associations of private schools: the National Catholic Education Association, the National Association of Independent Schools, and the Lutheran Church--Missouri Synod. This paper extends an earlier study of their data by examining whether more accurate national expenditure estimates can be derived by linking expenditure data with information on school characteristics collected as part of the National Center for Education Statistics Schools and Staffing Survey (SASS). If an appropriate model relating school characteristics and per-pupil expenditures could be estimated, it might be used to impute per-pupil expenditures for the full sample of private schools. Models incorporating a number of variables were explored, but in spite of the researchers' success in identifying school characteristics related to per-pupil expenditures, these characteristics do not fully explain the large differences in per-pupil expenditures among three sectors of private schools in this study: Lutheran day schools, independent day schools, and boarding schools. It is suggested that the model for Lutheran day schools is likely to provide reasonable estimates of per-pupil expenditures for many religious and nonsectarian private schools, but this assumption cannot be checked with the data

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available. To obtain improved estimates of the total amount spent by private schools in the United States, it will be necessary to collect data from a national sample of private schools, either through the SASS or a new special-purpose survey. An appendix contains 4 tables reporting results from the models predicting various school characteristics. (Contains 12 tables and 4 references.) (SLD)

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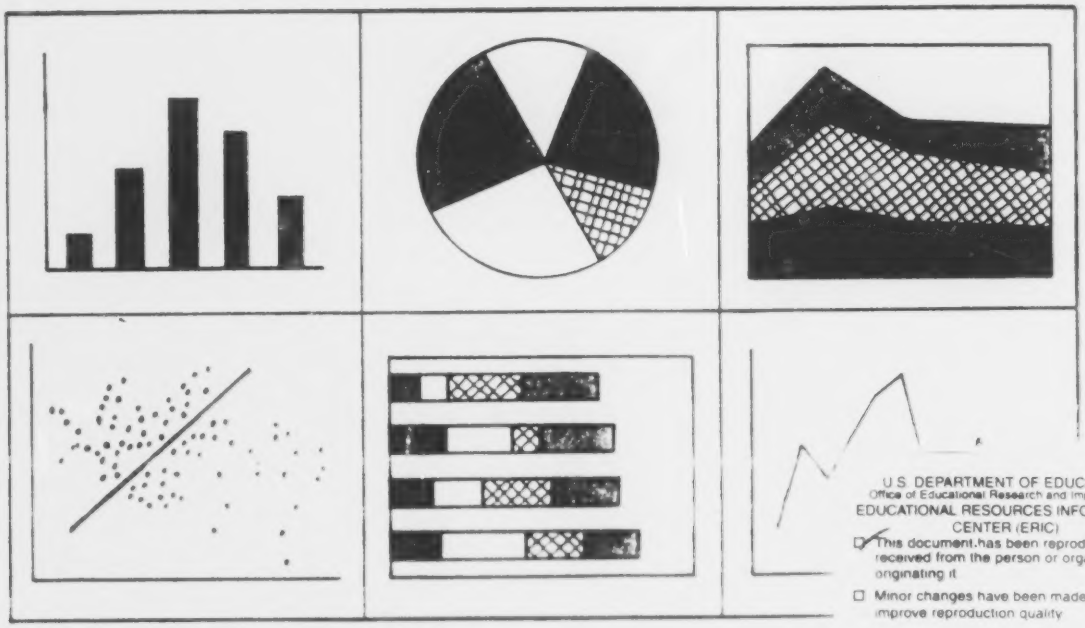

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The Determinants of Per-Pupil Expenditures in Private Elementary and Secondary Schools: An Exploratory Analysis

Working Paper No. 97-07 March 1997

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March 1997

Foreword

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March 1997

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Executive Summary

Policy makers have expressed increasing interest in information about expenditures by private elementary and secondary schools, but nationally representative data on private school expenditures are not currently available. In the absence of expenditure data on a representative sample of private schools, it may nevertheless be possible to derive national estimates of total expenditures by private schools indirectly, by making use of expenditure data that some associations of private schools routinely collect from their members. In particular, data on expenditures are routinely collected by three major associations of private schools: the National Catholic Education Association (NCEA), the National Association of Independent Schools (NAIS), and the Lutheran Church — Missouri Synod (LCMS).

In earlier work, we completed an exploratory study to assess whether data collected by the NCEA, NAIS, and LCMS could be used to develop a plausible estimate of total expenditures for the population of private schools in the United States. We drew on expenditure data from these three associations, along with data on sector, region, and school size, to impute per-pupil expenditures for the full set of schools included in the NCES Private School Survey (PSS) data set. The imputed per-pupil expenditures permitted us to produce a range of estimates of total national spending by private schools.

In the work reported here, we extend our earlier study by examining whether more accurate national expenditure estimates can be derived by linking expenditure data collected by private school associations with information on school characteristics collected as part of the NCES Schools and Staffing Survey (SASS). If an appropriate model relating school characteristics (as measured in the SASS) and per-pupil expenditures (as measured through association surveys) can be estimated, it might be used to impute per-pupil expenditures for the full sample of private schools in SASS. The resulting imputations might in turn be used to

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develop national expenditure estimates that may be more reliable than the estimates we obtained in our 1995 study, based on sector, size, and region.

We explored models incorporating the following school-level variables from the SASS administrator and schools surveys: the teacher-student ratio; the lowest and highest teacher salary; the number of full-time administrators, support staff, and maintenance staff; the number of part-time staff; grade-level organization (e.g., elementary, secondary, and combined); coeducation status; and programs offered (e.g., programs for the gifted and talented or Title I). The results indicate that several school characteristics are clearly associated with per-pupil expenditures, including teacher salaries, the teacher-student ratio, and the ratio of support staff and maintenance staff to teachers. In addition, several structural factors, including grade-level organization and coeducational status, also appear to be related to per-pupil expenditures. There is also an indication that schools that offer Title I programs spend less per pupil than do schools similar in staffing and other characteristics.

Despite our success in identifying school characteristics related to per-pupil expenditures, these characteristics do not fully explain the large differences in per-pupil expenditures among the three sectors of private education under study: Lutheran day schools, NAIS day schools, and NAIS boarding schools. In order to use the models we have developed to impute per-pupil expenditures for other sectors of private education, it would be necessary to decide whether to rely on model estimates for Lutheran day, NAIS day, or NAIS boarding schools. Based on informal discussions with representatives of major associations of private schools, we believe that imputed values based on the model results for Lutheran schools are likely to provide reasonable estimates of per-pupil expenditures for many religious and non-sectarian private schools, but this assumption cannot be checked with the data available.

Thus, we conclude that to obtain improved estimates of the total amount spent by private schools in the United States, it will be necessary to collect data on expenditures directly from a national sample of private schools — either through the SASS or through a new special-purpose survey. While much can be learned about the determinants of expenditures through models of the kind estimated here, such modeling efforts cannot, we believe, substitute for the collection of new data.

Introduction

Policy makers have expressed increasing interest in information about expenditures by private elementary and secondary schools, but nationally representative data on private school expenditures are not currently available. In the absence of expenditure data on a representative sample of private schools, it may nevertheless be possible to derive national estimates of total expenditures by private schools indirectly, by making use of expenditure data that some associations of private schools routinely collect from their members. In particular, data on expenditures are routinely collected by three major associations of private schools: the National Catholic Education Association (NCEA), the National Association of Independent Schools (NAIS), and the Lutheran Church — Missouri Synod (LCMS). While these three associations do not cover the full range of private schools, schools affiliated with these organizations enroll about 60 percent of all students enrolled in private schools in the United States, and thus the associations' data on expenditures may provide a useful foundation on which to build a more complete understanding of private school spending.

In earlier work, we completed an exploratory study to assess whether data collected by the NCEA, NAIS, and LCMS could be used to develop a plausible estimate of total expenditures for the population of private schools in the United States (Garet, Chan, and Sherman, 1995). We drew on data from these three associations, along with data from the NCES Private School Survey (PSS), to develop national estimates of total expenditures. In the work reported here, we extend our earlier study by examining whether more accurate national expenditure estimates can be derived by linking expenditure data collected by private school associations with information on school characteristics collected as part of the NCES Schools and Staffing Survey (SASS).

We present the results of this exploratory study in several sections. First, we review the approach we used in our earlier study, and we outline the approach we take here. Then, we

discuss the procedures used to link expenditure data from private school associations with data from the SASS, and we discuss the variables used in our analysis. Next, we discuss the relationship between school characteristics and per-pupil expenditures, and we estimate the parameters of a regression model predicting expenditures. Finally, we consider the implications of the study for further efforts to understand private school expenditures using association data.

Background

In our 1995 study, we developed a range of estimates of expenditures by private schools, drawing on data collected by the NCEA, NAIS, and LCMS. We proceeded by using expenditure data collected by the three associations to impute per-pupil expenditures for schools in other sectors. To carry out the imputations, we computed estimates of the average per-pupil expenditures for elementary and secondary schools affiliated with the NCEA and the LCMS, as well as estimates of the average per-pupil expenditures for elementary, secondary, and combined schools affiliated with the NAIS.[1] In addition, we computed estimates of average per-pupil expenditures for elementary, secondary, and combined schools for each association by region, and again by school size.

We used these estimates, along with enrollment and religious affiliation information from the 1991-92 PSS, to impute expenditures for all private schools in the country.[2] We drew on the

[1]Combined schools (i.e., schools enrolling students in both elementary and secondary grades) are common in the NAIS and in other sectors of private education, but very few schools affiliated with the NCEA and LCMS have a combined grade-level organization. Almost all schools affiliated with the NCEA or LCMS are either K-8 or 9-12.

[2]The PSS is a periodic survey gathering basic information on enrollment and affiliation for most private schools in the United States. (See Broughman, Gerald, Bynum, and Stoner, 1994.) The schools included in the survey are drawn from two frames. The primary source of schools is a "list frame" that contains most private schools in the country. The list frame is assembled from several sources, including lists provided by state departments of education and membership lists provided by private school associations. The list frame is supplemented by an "area frame" containing private schools identified in a thorough search of telephone books and other sources in randomly selected geographic areas around the country. The schools identified through the area search are weighted and combined with schools in the list frame to produce a full population estimate of the number of private schools in the country.

PSS to classify all private schools in the country into 19 mutually exclusive and collectively exhaustive sectors, based on grade level organization, association membership, and religious affiliation.[3] Within each sector, we also classified schools by region and size. We then developed several estimates of expenditures for schools in each sector and region or size group, relying on the overall, regional, or size-based per-pupil expenditure estimates derived from the NCEA, LCMS, or NAIS data.

For the Catholic, Lutheran, and NAIS sectors, we relied on the per-pupil expenditures we derived from the association data, along with enrollment information from the PSS, to estimate sector expenditure totals. For schools in all remaining sectors, with the exception of special education schools, we imputed expenditures based on two sets of per-pupil expenditure estimates for each sector, one set derived from NCEA data and one set derived from LCMS data. For special education schools, we derived estimates based on NAIS non-sectarian schools. These procedures produced estimates of 1991-92 total operating expenditures for private education in the United States ranging from $16.4 to $17.7 billion.

While the procedures we used in the 1995 study are plausible, they make use of information on only three school characteristics that may be expected to influence per-pupil expenditures: sector, region, and school size. In the work reported here, we seek to build on our earlier study, by identifying additional school characteristics related to per-pupil expenditures. In particular, we examine information on school characteristics collected as part of the Schools and Staffing Survey (SASS) conducted by NCES (Gruber, Rohr, and Fondelier, 1994).

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[3]The 19 sectors include Catholic elementary and secondary schools (2 sectors); Lutheran elementary and secondary schools (2 sectors); religious elementary, secondary, and combined schools affiliated with the NAIS (3 sectors); other religious elementary, secondary, and combined schools (3 sectors); non-sectarian elementary, secondary, and combined schools affiliated with the NAIS (3 sectors); other non-sectarian elementary, secondary, and combined schools (3 sectors); and elementary, secondary, and combined special education schools (3 sectors). See Garet, Chan, and Sherman, 1995.

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SASS has collected data on a nationally-representative sample of private schools in 1987-88, 1990-91, and 1993-94. In the study reported here, we proceeded by merging school characteristics data from the 1990-91 SASS with the school expenditure data gathered by NAIS and LCMS.[4] While the resulting sample size is relatively modest, it provides a first opportunity to explore relationships among school characteristics and expenditures for private schools.

If an appropriate model relating school characteristics (as measured in the SASS) and per-pupil expenditures (as measured through association surveys) can be estimated, it might be used to impute per-pupil expenditures for the full sample of private schools in SASS. The resulting imputations might in turn be used to develop national expenditure estimates that may be more reliable than the estimates we obtained in our 1995 study, based on sector, size, and region.

Linking the Data Sets

We relied on four data sets: data on school expenditures for the 1992-93 school year provided by the Lutheran Church — Missouri Synod; data on expenditures for the 1991-92 school year provided by the National Association of Independent Schools; data on school characteristics gathered as part of the 1990-91 Schools and Staffing Survey; and data containing school names and addresses that can be linked to the SASS, from the 1991-92 Private School Survey.[5] We discuss each of these four data sets in turn, and, in addition, consider some methodological issues that arose in carrying out the effort to match records from multiple sources.

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[4]School expenditure data are also collected by the NCEA for a sample of member schools, but the data are available only in aggregate form, and thus the NCEA data cannot be used in the study reported here. We derived the per-pupil expenditure estimates we used in our 1995 study from published NCEA tables displaying per-pupil expenditures by school size and region.

[5]See Garet, Chan, and Sherman, 1995, for a more complete discussion of the LCMS and NAIS data sets.

Table 1, below, contains summary information on the sample sizes for the data sets provided by the LCMS and NAIS, as well as the number of schools reporting LCMS affiliation or NAIS membership in the SASS and PSS.[6]

TABLE 1

Sample Sizes for LCMS, NAIS, PSS, and SASS Data Sets

Association	n, LCMS and NAIS data sets (A)	n, PSS schools reporting LCMS or NAIS affiliation (B)	A as a % of B	n, LCMS and NAIS schools with matched PSS records (C)	C as a % of A	n, SASS schools reporting LCMS or NAIS affiliation (D)	D as a % of B
LCMS	996*	1,075	92.7%	928**	93.2%	135	12.6%
NAIS	939*	1,334	70.4%	922**	98.2%	347	26.0%

*Excludes schools offering only early childhood or preschool programs
**Includes LCMS and NAIS schools that match any schools in the PSS data set, including PSS schools that are out-of-scope or did not respond to the PSS survey

The LCMS data set. The 1992-93 LCMS data set contains information gathered through an annual survey of member schools. The survey asks schools to report total expenditures, as well as total enrollment and other school characteristics. The data set we were provided contains records for 2,046 schools. Each school record contains an indicator variable classifying the school as early childhood or prekindergarten only, elementary, or secondary. Of the schools in the data set, 1,050 were classified as early childhood only, leaving 996 elementary and secondary schools.

[6]The 1991-92 PSS data set contains n=28,799 schools. Of these, 24,282 are classified as "in-scope" (i.e., they offer grade one or higher), and the remaining 4,517 are "out of scope" (i.e., they were included in the list or area frames but do not offer grade one or higher). Of the 24,282 "in-scope" schools, 512 did not respond to the PSS, leaving 23,766 cases in the main PSS analytic data set from which the results in NCES publications based on the PSS are derived.

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The number of schools in the LCMS data set is slightly lower than the 1,075 PSS schools reporting LCMS affiliation.[7] Some of this difference may be due to non-response on the LCMS survey, and some may be a result of differences in survey year: the PSS data pertain to the 1991-92 academic year, while the LCMS data pertain to 1992-93.

The NAIS data set. Like the LCMS data, the NAIS data are also gathered through an annual survey. The data set we were provided contains information on total operating expenditures, as well as various components of expenditures, and enrollment by grade, for 1,035 schools. Of these, 96 are foreign schools, leaving 939 domestic elementary and secondary schools. The number of domestic elementary and secondary schools in the NAIS data set (939) is substantially lower than the number of PSS schools reporting NAIS membership (1,334).[8] Since the NAIS requires completion of its annual survey as a condition of membership, the discrepancy between the NAIS sample size and the PSS schools reporting NAIS membership cannot be explained by non-response on the NAIS survey. We therefore conclude that at least some schools that report NAIS membership on the PSS survey are not official members of NAIS, as recorded by the association. We expect that some of these schools are probably members of NAIS state affiliates, and many schools may not make a clear distinction between membership in the national association and its state affiliates (although in fact the membership records are separate).

Linking the LCMS, NAIS, and PSS data sets. As a first step in linking data provided by the LCMS and NAIS with data from SASS, we matched records in the LCMS and NAIS data sets with records in the 1991-92 PSS. (The PSS contains school names and addresses that can be matched with LCMS and NAIS records, as well as ID's that can be matched with the SASS.) To

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[7]This is the unweighted n. The weighted number of PSS schools reporting LCMS membership is 1,086.

[8]This is the unweighted n. The weighted number of PSS schools reporting NAIS membership is 1,404.

match the LCMS and NAIS schools with the PSS, we relied on several methods.[9] First, we matched schools based on school name, city, and state. This method successfully matched somewhat more than half of the schools in the LCMS and NAIS data sets. We then attempted to match the remaining schools by zip code. We examined all resulting matches by hand to weed out "false" matches (i.e., different schools that shared a common zip code).

In the process of matching schools, we encountered various complications that make it difficult to report an exact number of successful matches. For example, in some cases, a combined K-12 school appearing in the NAIS data set appeared as separate K-6 and 7-12 schools in the PSS. (See Garet, Chan, and Sherman, 1995.) In addition, duplicate records appeared in both the PSS and the NAIS and LCMS data sets. Finally, some matching schools classified as "in-scope" in the association data sets (i.e., as offering at least a first grade) were classified as "out-of-scope" in the PSS.

For purposes of assessing the number of matches, we include only unduplicated LCMS and NAIS schools classified as in-scope in the association data (i.e., classified as domestic schools offering at least a first grade), and we include matches with both in-scope and out-of-scope PSS schools. Using this definition, we ultimately were able to match 928 of the 996 schools in the LCMS data set with schools in the PSS (about 93%).[10] We were able to match 922 of the 939 schools in the NAIS data set (about 98%).[11]

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[9]The matching of NAIS and PSS schools is discussed in more detail in Garet, Chan, and Sherman, 1995. The process for the LCMS schools proved to be a bit more cumbersome than the procedure for NAIS, in that a smaller proportion of schools matched based on name, city, and state.

[10]Among the 928 LCMS schools that matched records in the PSS, 7 matched PSS schools that were out-of-scope or did not respond to the PSS survey. Also, for 6 of the matched LCMS schools, duplicate records appeared in the PSS.

[11]Among the 922 NAIS schools that matched records in the PSS, 31 matched schools that were out-of-scope or did not respond to the PSS survey, and 3 were single schools in the NAIS file but appeared as multiple schools in the PSS. For 5 of the 922 matching schools, duplicate records appeared in the PSS.

Linking the PSS and SASS data sets. The 1990-91 SASS gathered data from 2,620 private schools, or about 10% of all private elementary and secondary schools in the United States. Of the 2,620 schools in the SASS sample, 135 reported being affiliated with the Lutheran Church — Missouri Synod, and 347 reported membership in the National Association of Independent Schools. Thus, the number of schools reporting LCMS membership in the SASS sample is about 12.6% of the number in the PSS, while the number of schools reporting NAIS membership in the SASS is about 26.0% of the number in the PSS. The apparently unequal SASS sampling rates for the two associations may reflect the fact that the SASS sample is stratified by region and grade level organization. LCMS schools tend to be concentrated in the Midwest and are primarily elementary schools, while NAIS schools are more evenly distributed across regions and include a large number of elementary, secondary, and combined schools.

Since the PSS and SASS share a common set of ID's, we were able to merge the per-pupil expenditure data from the LCMS and NAIS schools directly with the SASS data, once we had completed the PSS-association match.[12] We proceeded by first linking the overall PSS data set with the SASS and then selecting the subsample with association data. Of the 2,620 schools in the 1990-91 SASS, 2,080 (79.4%) matched schools in the 1991-92 PSS. The SASS schools that did not appear in the PSS are primarily concentrated in the 1987 and 1989 area-search segments of the SASS sample (see Table 2).[13]

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[12]The common ID, which differs from either the regular SASS or PSS ID, is labeled "APIN" on the SASS data set and "EPIN" on the PSS data set. It is based on the ID used in the 1987 QED list, which forms the core of the PSS data set. Schools included in the sample as a result of association lists or area searches have been given special APIN/EPIN numbers.

[13]Like the PSS, the SASS sample is based on a list frame and an area sampling frame, which includes schools identified in a thorough search of randomly selected geographic areas. According to the documentation for the 1990-91 SASS and the 1991-92 PSS, the area frames for the two surveys contain some PSU's in common. Thus, it is unclear why no schools in the area frames for the 1990-91 SASS appear in the 1991-92 PSS. It is possible that the ID's for the area frame schools are inconsistent in the two data sets.

TABLE 2

Percent of 1990-91 SASS Schools Matching Schools in the 1991-92 PSS

Source of SASS School	Schools in 1990-91 SASS Sample	% SASS Schools Matching Schools in 1991-92 PSS*
1987 area search	140	0.0%
1987 association additions	93	91.4%
1986/87 QED list	2,002	95.0%
1989 QED additions	23	87.0%
1989 association additions	87	81.6%
1989 area search	270	0.0%
1990 association additions	5	40.0%
Overall	2,620	79.4%

*Includes only in-scope schools that responded to the PSS (n=23,766)

SOURCE: 1990-91 Schools and Staffing Survey and 1991-92 Private School Survey

The final analytic data set. Of the 2,080 SASS schools that matched cases in the PSS, 344 were schools for which we had matched association data — 105 Lutheran schools and 239 NAIS schools. The 105 Lutheran schools in the linked sample comprise about 78% of the 135 SASS schools that report an affiliation with the Missouri Synod. The 239 NAIS schools in the linked sample comprise about 69% of the 347 schools in the SASS that report an NAIS affiliation. The difference between the LCMS and the NAIS in the percent matching, we believe, is primarily due to the fact the some schools reporting NAIS membership on the SASS are members of NAIS state or local affiliates, but not members of NAIS itself.

Of the 105 Lutheran schools in our sample, 101 are regular day schools, three are boarding schools, and one is a special education school. Of the 239 NAIS member schools, 135

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are regular day schools, 62 are regular boarding schools, 2 are Montessori schools, 22 are schools with a special emphasis (i.e., science or math), 7 are special education schools, and 11 are alternative (nontraditional) schools. Given the relatively small sample sizes, we concluded that the analyses should focus entirely on regular day and regular boarding schools, and we excluded the Montessori, special emphasis, special education, and alternative schools from the analytic sample. In addition, since boarding schools generally include room and board as part of the per-pupil expenditures, we treat boarding schools separately from regular day schools in many of our analyses Since Lutheran and NAIS schools differ substantially in average per-pupil expenditures, we begin our descriptive analyses by treating the two associations separately. And, since there are only three Lutheran boarding schools in the sample, we excluded them from the final analytic data set. Thus, our analysis is based on 101 Lutheran regular day schools, 135 NAIS regular day schools, and 62 NAIS regular boarding schools.

The Variables

The principal focus of our study is per-pupil expenditures, as reported by the schools in the Lutheran and NAIS data sets.[14] The average per-pupil expenditure varies dramatically across the three types of schools under study, ranging from about $2,200 for the Lutheran regular day schools in our sample, to more than $8,000 for the NAIS regular day schools, and more the $19,000 for the NAIS regular boarding schools (see Table 3, below). There is also a considerable range within types of schools (the standard deviation ranges from about $900 for Lutheran schools to more than $6000 dollars for NAIS boarding schools).

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[14]In both the LCMS survey, schools were asked to report total operating expenditures. In the NAIS survey, they were asked to report various components of expenditures, along with the total. We divided total expenditures for each school by total enrollment to obtain per-pupil expenditures.

TABLE 3

Per Pupil Expenditures for Private Schools in Sample, by School Type

	School Type		
	Lutheran Day	NAIS Day	NAIS Boarding
Sample size (n)	101	135	62
Per pupil expenditures ($)	2,200 (914)	8,337 (2,564)	19,233 (6,866)

Standard deviations in parentheses

SOURCE: 1992-93 Lutheran Church-Missouri Synod Survey and 1991-92 National Association of Independent Schools Survey

The variation across schools may be associated with various school characteristics that might be used in models to predict and impute per-pupil expenditures, and for which data are available in the SASS school or administrator questionnaires. One set of characteristics concerns staff salaries. Staff salaries make up the largest share of the budget in most, if not all, private schools (Isaacs, Garet, and Sherman, 1996). While the SASS does not contain data on total staff salaries, it does include items on the salary schedule for teachers, as well as data on the number of full- and part-time staff of various types (e.g., instruction and administration). SASS also contains information on the staff benefits provided to teachers.

Beyond staff salaries and benefits, other factors contributing to expenditures include materials, supplies, and the costs associated with acquiring and maintaining buildings and grounds (Isaacs, Garet, and Sherman, 1996). Unfortunately, none of these items are included on the 1991-92 SASS. But several school characteristics for which data are available may serve as indirect indicators of these expenses. First, school enrollment may serve as a proxy for facilities, in that large schools may maintain more complex and expensive physical facilities than small schools.

Coeducational status and grade-level organization may also serve as proxies for expenses on physical plant and materials and supplies. For example, high schools may spend more per student on athletic facilities and laboratory equipment than do elementary schools. Finally, special programs, such as programs for the gifted and talented or for students with disabilities, may contribute to expenditures by contributing to the costs of supplies and facilities, even after expenditures for staffing are taken into account.

We will discuss each of these variables in more detail, below.

Salaries. SASS asked schools to report whether they employ a salary schedule for teachers. Schools that used a salary schedule were asked to report the salary for a teacher with a Bachelor's degree and no experience, as well as the salary at the highest possible step on the schedule.[15] Schools that did not employ a schedule were asked to report the lowest and highest salary currently paid to a regular full-time teacher. We collapsed the two forms of salary data to create two common variables for all schools in the sample: the lowest salary and the highest salary offered.[16]

As can be seen in Table 4, there are differences across school types in teacher salaries (especially in the highest salaries), but the between-sector differences in salary are not as dramatic as the differences in per-pupil expenditures. For example, the average value of the highest teacher salary offered by NAIS day schools is only about fifty percent above the average value of the highest salary offered by Lutheran day schools, while the mean per-pupil expenditure for NAIS day schools is nearly four times the mean per-pupil expenditure for Lutheran day schools (see Table 3).

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[15]Respondents were also asked to report the scheduled salary for a teacher with a master's degree and no experience, as well as a master's degree and 20 years of experience.

[16]The SASS data set contains imputed values for all variables left missing by the respondent, along with a set of imputation flags to indicate whether is imputed or real. We treated all imputed values as if they were actual data.

TABLE 4

Salaries and Staffing for Private Schools in Sample, by School Type

	School Type		
	Lutheran Day	NAIS Day	NAIS Boarding
Sample size (n)	101	135	62
Salaries			
Lowest teacher salary ($)	15,221 (2,260)	19,214 (2,974)	15,896 (3,416)
Highest teacher salary ($)	25,936 (5,283)	37,871 (8,863)	34,569 (9,768)
Principal/head salary ($)	30,158 (8,095)	67,483 (21,452)	64,931 (25,921)
Staffing			
Teachers per ten students	.55 (.20)	1.02 (0.23)	1.36 (0.49)
FT administrators per teacher	.08 (.09)	.06 (.06)	.07 (.06)
FT support staff per teacher	.02 (.05)	.17 (.16)	.28 (.16)
FT maintenance and other staff per teacher	.24 (.30)	.33 (.50)	.92 (.74)
FT aides per teacher	.04 (.12)	.04 (.12)	.05 (.20)
PT staff per teacher	.45 (.46)	.14 (.18)	.24 (.38)

Standard deviations in parentheses

SOURCE: 1990-91 Schools and Staffing Survey

The SASS administrator survey asked the principal or headmaster to report his or her regular annual salary before taxes and deductions. We used the salary data exactly as reported, with the exception of three schools for which the reported salary was zero. We converted these

three salaries to $9,000 (the lowest non-zero value). As Table 4 indicates, principals in NAIS schools earn a little more than twice what their counterparts earn in Lutheran schools.

Staffing. We examined a variety of measures of school staffing. First, each school reported the total number of FTE teachers who teach grades K-12 or comparable ungraded levels. We use this as our basic measure of the size of the teaching force. To standardize for school size, we divide by total K-12 enrollment and multiply by ten, producing an index of the number of teachers for each ten students. The teacher-student ratio varies substantially across the three schools types (see Table 4). In Lutheran schools, the average is about .55 teachers per ten students, while in NAIS day schools it is a little over 1.00, and in NAIS boarding schools it is 1.36.

Each school was also asked to report the total number of full-time and part-time staff in various non-teaching positions, including headmaster, assistant headmaster, student and instructional support services, and several other categories. We collapsed these into the following variables: number of full-time administrative staff, full-time support staff, full-time maintenance and other staff (including clerical), full-time teacher/library aides, and part-time staff.[17] To standardize for school size, we express the number of staff as a ratio of staff per FTE teacher (i.e., support staff per teacher, or teacher aides per teacher).[18]

While the number of full-time administrators per teacher varies little across the three school types, there is considerable variation in full-time support staff and full-time maintenance and other staff, both of which are more common in NAIS than in Lutheran schools. On the other hand, part-time staff are more common in Lutheran than NAIS schools (see Table 4).

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[17]Unfortunately, the 1990-91 SASS did not distinguish maintenance, business, and clerical staff. The 1993-94 SASS contains a set of categories that closely parallel the NCES data collection instruments for public school finance.

[18]The rationale for this standardization is described more fully in the discussion of regression models, below.

Teacher benefits provided. The surveys asked whether the school provides each of the following benefits for teachers: dental insurance, housing assistance (or on-campus housing), life insurance, meals, medical insurance, a pension, scholarships for children attending school, transportation assistance to and from school, and tuition assistance for teachers attending college courses. We include all of these in our analyses.[19] As can be seen in Table 5, nearly all Lutheran and NAIS schools offer medical insurance and a pension. But, apart from these two standard benefits, different types of assistance appear to be common in different types of schools. Lutheran schools, for example, are much more likely to offer dental benefits than are the other types of schools, while boarding schools, as one might anticipate, are especially likely to offer subsidized meals and housing for faculty.

TABLE 5

Staff Benefits Provided by Schools in Sample, by School Type

	School Type		
	Lutheran Day	NAIS Day	NAIS Boarding
Teacher benefits provided (%)			
Dental insurance	91.0	46.7	35.5
Housing	22.8	9.6	80.6
Life insurance	50.5	77.0	75.8
Meals	14.9	38.5	93.5
Medical insurance	98.0	96.3	95.2
Pension	93.1	94.8	96.8
Scholarships for children of staff	50.5	81.5	87.1
Transportation assistance	14.9	5.9	8.1
Tuition assistance for staff development	70.3	78.5	85.5

SOURCE: 1990-91 Schools and Staffing Survey

[19]For the insurance benefits (dental, medical, and life), the survey asked whether the teacher is required to pay the entire premium, or whether the school pays part. We coded the school as offering the benefit only if the school paid at least some of the premium.

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Enrollment. In computing per-pupil expenditures, we relied on enrollment data for each school provided by the LCMS and NAIS. But, in computing the student-teacher ratio, we rely on the enrollment data as reported in the SASS. We chose to use the SASS enrollment data in our models because it was gathered in the same year as the staffing data and was reported in FTE's. Table 6 provides some information on the enrollment distribution for the schools in the sample. In general, most of the Lutheran schools enroll 200 or fewer students (nearly half enroll between 100 and 200). The NAIS schools (especially the day schools) tend to be somewhat larger. More than a third of the NAIS day schools, for example, enroll more than 500 students.

TABLE 6

Enrollment, Coeducation Status, and Grade Level Organization for Schools in Sample, by School Type

	School Type		
	Lutheran Day	NAIS Day	NAIS Boarding
Enrollment (%)			
less than 100	23.8	0	4.9
100-199	47.5	14.1	30.7
200-299	15.8	17.8	22.6
300-499	11.9	31.9	19.4
500 or more	1.0	36.3	22.6
Coeducation status (%)			
Coeducational	100.0	82.9	69.3
All boys	0.0	5.2	19.4
All girls	0.0	11.9	11.3
Grade level organization (%)			
Elementary	85.1	24.4	0.0
Secondary	9.9	11.1	61.3
Combined	5.0	64.4	38.7

SOURCE: 1990-91 Schools and Staffing Survey

Coeducational status. All of the Lutheran schools in the sample are coeducational, but a substantial number of NAIS schools are single-sex. We created two indicator variables, one representing all-boy schools, and one all-girl schools.[20]

Grade-level organization. We defined three grade-level groups. Schools with a highest grade less than or equal to 8th, and a lowest grade less than or equal to 6th are classified as elementary. Schools with a highest grade greater than or equal to 9th and a lowest grade greater than or equal to 7th are classified as secondary. All other schools (i.e., schools, with a highest grade greater than or equal to 9th, but a lowest grade less than 7th) are classified as combined. The great majority of the Lutheran schools are elementary, while most of the NAIS schools are secondary or combined (see Table 6).

Programs offered. The SASS surveys asked each school to report whether each of the following types of programs is offered: bilingual programs, Title I, diagnostic/prescriptive programs, English as a Second Language programs, programs for gifted and talented youth, remedial reading, remedial mathematics, and special education. We examine all of these (with the exception of remedial reading and mathematics) in our analyses. As might be anticipated, Title I programs are more common at Lutheran schools than at NAIS schools (see Table 7), but English as a Second Language programs are especially common at NAIS boarding schools. Special education programs are relatively uncommon at all three types of schools.

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[20]In regressions including the two indicator variables, the coefficients can be interpreted as the effects of all-boy and all-girl status, contrasted with coeducational status (the omitted category).

TABLE 7

Programs Offered by Schools in Sample, by School Type

	School Type		
	Lutheran Day	NAIS Day	NAIS Boarding
Programs offered (%)			
Bilingual	2.0	1.0	1.6
Title I	26.7	3.0	0.0
Diagnostic/prescriptive	41.6	38.5	41.9
English as a Second Language	5.9	10.4	71.0
Gifted	23.8	40.7	38.7
Special education	10.9	10.4	14.5

SOURCE: 1990-91 Schools and Staffing Survey

The Relationship Between School Characteristics and Per-pupil Expenditures

Tables 8, 9, 10, and 11, below, contain information on the correlation between each of the measured school characteristics discussed above and per-pupil expenditures. The correlations are presented separately for each of the three types of schools included in our analyses (Lutheran day, NAIS day, and NAIS boarding) to avoid confounding the within-sector correlations with the substantial between-sector differences in per-pupil spending and other characteristics.

Teacher and administrator salaries, as anticipated, are generally positively correlated with per-pupil expenditures, although the correlations of the lowest and highest teacher salary with per-pupil expenditures for NAIS boarding schools are negative in sign. (See Table 8.)

The ratio of teachers to students is very strongly and positively correlated with expenditures per student for all three types of schools. Indeed, the teacher-student ratio has the single most consistent correlation with per-pupil expenditures among the variables examined. The employment of non-teaching staff also appears to have a strong influence on per-pupil

TABLE 8

Correlation Between Salaries, Staffing and Per Pupil Expenditures, by School Type

	School Type		
	Lutheran Day	NAIS Day	NAIS Boarding
Salaries			
Lowest teacher salary	.12	.46	-.18
Highest teacher salary	.20	.55	-.10
Principal/head salary	.20	.36	.10
Staffing			
Teachers per ten students	.57	.36	.41
FT administrators per	-.00	-.16	.06
FT support staff per teacher	.30	.25	.32
FT maintenance and other	.17	.21	.16
FT aides per teacher	-.08	-.13	.06
PT staff per teacher	-.09	-.20	.23

Entries in the table are the correlations between the indicated variables and per-pupil expenditures

SOURCE for per-pupil expenditures: 1992-93 Lutheran Church-Missouri Synod Survey and 1991-92 National Association of Independent Schools Survey.

SOURCE for all other variables: 1990-91 Schools and Staffing Survey.

expenditures. For example, full-time support staff per teacher is positively correlated with per-pupil expenditures across all three school types, as is full-time maintenance staff per teacher. Part-time staff per teacher is *negatively* correlated with per-pupil expenditures for both Lutheran day and NAIS day schools, possibly indicating that schools that make use of part-time staff use them to replace other more costly approaches to staffing. On the other hand, the number of part-time staff per teacher is positively correlated with per-pupil expenditures for NAIS boarding schools.

The correlations among staff benefits provided for teachers and per-pupil expenditures are generally modest in magnitude and inconsistent in sign across the three school types. (See Table 9.) For some types of benefits — for example, health care or dental care — the inconsistent pattern of results may reflect the fact that schools vary in the portion of the premium they require teachers to pay. In addition, the provision of some types of benefits — for example, housing, meals, and transportation for teachers — may substitute for other larger expenditures (such as expenditures on salaries) that would be required if schools did not provide benefits.

TABLE 9

Correlation Between Staff Benefits Provided and Per Pupil Expenditures, by School Type

	School Type		
	Lutheran Day	NAIS Day	NAIS Boarding
Teacher benefits provided			
Dental insurance	.08	.17	-.29
Housing	-.14	.09	.30
Life insurance	.05	.02	.24
Meals	-.12	.32	.25
Medical insurance	.07	.05	.19
Pension	.03	.05	.24
Scholarships for children of staff	.39	.09	-.18
Transportation assistance	-.24	.06	-.26
Tuition assistance for staff development	.04	-.04	.34

Entries in the table are the correlations between the indicated variables and per-pupil expenditures

SOURCE for per-pupil expenditures: 1992-93 Lutheran Church-Missouri Synod Survey and 1991-92 National Association of Independent Schools Survey.

SOURCE for all other variables: 1990-91 Schools and Staffing Survey.

The relationship between school size and per-pupil expenditures is inconsistent across sectors. (See Table 10.) This may, in part, reflect the fact that school size is associated with several factors that have opposite effects on expenditures. In particular, large schools tend to offer higher teacher salaries than smaller schools, but large schools also tend to have smaller teacher-student ratios. Large schools also tend to have somewhat smaller support-staff ratios than smaller schools. (See Appendix A.)

TABLE 10

Correlation Between Enrollment, Coeducation Status, Grade Level Organization and Per Pupil Expenditures, by School Type

	School Type		
	Lutheran Day	NAIS Day	NAIS Boarding
Enrollment			
Number of students	-.04	.16	-.45
Coeducation status			
All boys	—	.18	.33
All girls	—	.19	.13
Grade level organization			
Elementary	-.63	-.32	—
Secondary	.70	.15	.48
Combined	-.01	.18	-.48

Entries in the table are the correlations between the indicated variables and per-pupil expenditures

SOURCE for per-pupil expenditures: 1992-93 Lutheran Church-Missouri Synod Survey and 1991-92 National Association of Independent Schools Survey.

SOURCE for all other variables: 1990-91 Schools and Staffing Survey.

Single-sex status is positively associated with per-pupil expenditures, for both NAIS day and NAIS boarding schools. That is, for both NAIS day and NAIS boarding schools, all-boy and all-girl schools have higher per-pupil expenditures then do coeducational schools. (All Lutheran

schools in the sample are coeducational.) This may imply that single-sex schools generally spend more on materials, supplies, and physical plant per student than do coeducational schools. Also, as anticipated, elementary school status is negatively correlated with per-pupil spending, while secondary and combined status are positively correlated with spending. (See Table 10.)

Table 11 displays the correlations between program offerings and per-pupil expenditures. Few of the correlations are large for any of the three types of schools under study. There is some indication that the provision of Title I is negatively associated with per-pupil expenditures. Otherwise, the signs of the correlations are fairly inconsistent, and the patterns are difficult to explain.

TABLE 11

Correlation Between Programs Offered and Per Pupil Expenditures, by School Type

	School Type		
	Lutheran Day	NAIS Day	NAIS Boarding
Programs offered			
Bilingual	-.05	.00	-.14
Title I	-.33	-.04	—
Diagnostic/prescriptive	-.38	.01	.10
English as a Second Language	-.03	.15	-.03
Gifted	.21	.02	-.39
Special education	-.05	.04	-.20

Entries in the table are the correlations between the indicated variables and per-pupil expenditures

SOURCE for per-pupil expenditures: 1992-93 Lutheran Church-Missouri Synod Survey and 1991-92 National Association of Independent Schools Survey.

SOURCE for all other variables: 1990-91 Schools and Staffing Survey.

Models of Expenditures Per Student

The correlations displayed above indicate that at least some of the school characteristics measured in SASS are strongly related to per-pupil expenditures. In this section, we develop a multivariate model predicting per-pupil spending.

We begin the development of the model by considering a model for total school expenditures and then turn to per-pupil spending. The development of a parsimonious and representationally-appropriate model for total school expenditures is complicated by the fact that the factors that influence expenditures do not have a simple linear additive effect. Consider, for example, a model incorporating only the number of teachers (x_1), the average teacher salary paid by the school (x_2), an indicator variable classifying the school as secondary versus elementary or combined (x_3), and school enrollment (x_4). A simple linear model for total school expenditures (y) might take the following form:

$$y = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4$$

This formulation is clearly inappropriate, since it implies that the effect of the number of teachers on total expenditures (b_1) is independent of the average salary paid by a school (x_2). Similarly, the model does not properly deal with differences in the scale of spending between small and large schools. The model implies, for example, that the dollar-effect of secondary versus elementary grade-level organization (b_3) is the same regardless of enrollment (x_4).

An alternative multiplicative formulation is more plausible:

$$y = e^{b_0} x_1^{b_1} x_2^{b_2} e^{b_3 x_3} x_4^{b_4}$$

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In this model, the coefficients b_1, b_2, and b_4 can be interpreted as elasticities.[21] Thus, b_1 is the percentage change in expenditures resulting from a one percent change in the number of teachers; b_2 is the percentage change in expenditures resulting from a one percent change in average salary; and b_4 is the percent change in expenditures resulting from a one percent change in enrollment. The value of e^{b3} indicates the percentage effect on expenditures of secondary versus elementary school status. (A value of b_3=0.7, for example, would indicate that secondary schools spend twice the amount spent by elementary schools, given the same average salary, number of teachers, and enrollment.) The coefficient b_4 reflects the costs associated with student enrollment that are not included in teacher salaries — for example, the costs of materials, supplies, and physical plant.

The model can be re-written to predict per-pupil expenditures:

$$y/x_4 = e^{b_0} x_1^{b_1} x_2^{b_2} e^{b_3 x_3} x_4^{b_4} x_4^{-1} = e^{b_0} [x_1/x_4]^{b_1} x_2^{b_2} e^{b_3 x_3} x_4^{b_1 + b_4 - 1}$$

In this form, per-pupil expenditures (y/x_4) is a function of the teacher-student ratio (x_1/x_4), average teacher salary (x_2), grade level organization (x_3), and school enrollment (x_4). The value $b'_4 = (b_1 + b_4 - 1)$ reflects the combined effects of scale on per-pupil expenditures. A positive value of b'_4 implies that per-pupil expenditures are higher in large schools than in small schools (controlling for teacher-student ratio, average teacher salaries, and grade-level organization), while a negative value implies economies of scale.

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[21] The elasticity interpretation can be derived by computing the first derivative of y with respect to each independent variable. Consider x_1. The first derivative can be written:

$$dy/dx_1 = b_0 b_1 x_1^{b_1 - 1} x_2^{b_2} e^{b_3 x_3} x_4^{b_4} = b_1 y/x_1$$

Thus, the percentage change in y resulting from a one per percent change in x_1 can be written:

$$\frac{dy/y}{dx_1/x_1} = b_1$$

There are two complications to consider in developing a final model. First, we lack data on average teacher salaries. Instead, we have the highest and lowest salary paid (or the highest and lowest salary on the school salary schedule). We can model the average teacher salary as a geometric average of highest and lowest salary (x_5 and x_6), with estimated weights b_5 and b_6.[22] This produces the equation:

$$y/x_4 = e^{b_0}[x_1/x_4]^{b_1} x_5^{b_5} x_6^{b_6} e^{b_3 x_3} x_4^{b'_4}$$

Finally, we are interested in examining the effects of the number of school staff other than teachers. We lack data on salaries for these staff, and thus we cannot employ the approach used for teachers. Instead, we view staff other than teachers as factors that increase spending over and above the level that would be obtained based on the total budget for teachers alone. To represent the effects of staff (for example, support staff, x_7), we compute the number of support staff per teacher (x_7/x_1). This produces the following model:

$$y/x_4 = e^{b_0}[x_1/x_4]^{b_1} x_5^{b_5} x_6^{b_6} e^{b_3 x_3} x_4^{b'_4} [x_7/x_1]^{b_7}$$

The parameter b_7 represents the percentage change in per pupil spending that results from a one percent change in the number of support staff per teacher.

For simplicity, we estimated the model in log form:

$$\ln(y/x_4) = b_0 + b_1 \ln(x_1/x_4) + b_3(x_3) + b'_4 \ln(x_4) + b_5 \ln(x_5) + b_6 \ln(x_6) + b_7 \ln(x_7/x_1)$$

The total number of school characteristic variables for which we have data is 28 — too many to include in a single model, given the available sample size. We thus experimented with alternative

[22]We experimented with models including the principal/head salary along with the lowest and highest teacher salary, but principal/head salary rarely had a significant effect in models controlling for teacher salaries, so we omitted the head salary in the final model.

specifications and dropped variables that were never statistically significant or had trivial effects that varied depending on the exact specification.

The final results are presented in the Table 12. In general, as expected, lowest and highest teacher salaries have a positive effect on per-pupil expenditures, although only for NAIS day schools are the coefficients statistically significant, and the coefficient for highest salary in the Lutheran day school equation is moderately negative. The effect of the teacher-student ratio is substantial. The teacher-student ratio is significant in all models, with coefficients of roughly 0.5, implying that a one percent increase in the number of teachers per student produces a one-half percent increase in expenditures per student. The number of full-time support staff per teacher and full-time maintenance staff per teacher are also significant in all models. In contrast to salaries and staff ratios, staff benefits do not generally have a significant effect, although the provision of meals for staff and scholarships for children of staff have modest positive effects in some models.

Both coeducation status and grade-level organization have substantial effects. The coefficient of 0.26 for all-boy status indicates that boys' schools spend about 28% more than coeducational or girls' schools with similar teacher-student ratios and other characteristics.[23] The effect for secondary schools is similar (b=.27). We believe these effects probably reflect the added costs associated with materials, supplies, and facilities in all-boy and secondary schools.

These is some indication that schools offering Title I programs have lower per-pupil expenditures than other schools. This effect is significant for Lutheran schools ($p<.05$), and nearly significant for NAIS day schools ($p<.10$). It is not clear whether this effect is due to the

[23]The percentage effect for boys schools is $e^{.26}$, or 0.28.

TABLE 12

Regression Estimates of the Effects of School Characteristics on the Log of Per Pupil Expenditures, by School Type

	School Type			
	Lutheran Day	NAIS Day	NAIS Boarding	All
Intercept	6.19***	1.04	2.63	3.33***
Salaries				
ln (Lowest teacher salary)	.22	.46**	.52	.34**
ln (Highest teacher salary)	-.05	.29**	.11	.13
Staffing				
ln (Teachers per ten students)	.28*	.65***	.57***	.47***
FT administrators per teacher	-.13	.61	1.60	.39
FT support staff per teacher	1.62*	.60**	.39	.59***
FT maintenance and other staff per teacher	.24*	.16*	.13*	.10**
PT staff per teacher	-.01	.22+	.06	.03
Teacher benefits provided				
Meals	.08	.04	.33+	.09*
Scholarships for children of staff	.04	.11+	.04	.07+
Coeducation status				
All boys	—	.10	.36**	.26***
Grade level organization				
Secondary	.43***	.08	.23*	.27***
Combined	.16	.10+	—	.12*
Programs offered				
Title I	-.25***	-.20+	—	-.23***
Diagnostic/prescriptive	-.14*	-.05	.04	-.06+
School type				
NAIS day	—	—	—	0.70***
NAIS boarding	—	—	—	1.09***
R^2	.65	.56	.59	.92

+ p<.10, * p<.05, ** p<.01, *** p<.001

SOURCE for per-pupil expenditures: 1992-93 Lutheran Church-Missouri Synod Survey and 1991-92 National Association of Independent Schools Survey.

SOURCE for all other variables: 1990-91 Schools and Staffing Survey.

fact that Title I picks up expenses that would otherwise appear in the operating budget, or whether the existence of Title I programs is a proxy for other school characteristics associated with low expenses. It is possible, for example, that schools offering Title I programs spend less on facilities or maintenance than other schools, and this might produce the observed negative effect for Title I.

The models for the three types of schools for which we have data explain a substantial percentage of the observed variation in per-pupil expenditures (R^2 = .65, .56, and .59 for Lutheran day schools, NAIS day schools, and NAIS boarding schools, respectively). Nevertheless, the measured variables included in the models do not fully account for the large sector differences in per-pupil expenditures. The coefficient for NAIS day schools in the pooled model (0.7) indicates that NAIS day schools spend twice as much as Lutheran day schools with the same measured characteristics ($e^{.7}$=2). NAIS boarding schools spend about 3 times as much as Lutheran day schools, controlling for measured characteristics. We expect that much of this difference results from the costs of physical plant and equipment, utilities, non-routine maintenance, and financial aid, which are usually included in NAIS total operating expenditures but are less likely to appear in the operating expenditures of other types of private schools. Many Lutheran schools, for example, share the costs of facilities and maintenance with a church, and thus some components of rent or maintenance may not appear as expenditures; most NAIS schools, on the other hand, pay the full cost of facilities. In addition, NAIS schools typically record financial aid as an expense, and, in many schools, this alone may add as much as 10 percent to the operating budget. (See Isaacs, Garet, and Sherman, 1996).

Conclusions

In the previous sections, we described an exploratory set of analyses based on a data set constructed by linking data on expenditures collected by the LCMS and NAIS, and data on school characteristics collected by the SASS. The analyses, while exploratory, indicate that several school characteristics are clearly associated with per-pupil expenditures, including teacher salaries, the teacher-student ratio, and the ratio of support staff and maintenance staff to teachers. In addition, several structural factors, including grade-level organization and coeducational status, also appear to be related to per-pupil expenditures. There is also an indication that schools that offer Title I programs spend less per pupil than do schools similar in staffing and other characteristics.

Despite our success in identifying school characteristics related to per-pupil expenditures, these characteristics do not fully explain the large differences in per-pupil expenditures between the three sectors of private education under study: Lutheran day schools, NAIS day schools, and NAIS boarding schools. Controlling for measured characteristics, NAIS day schools appear to spend twice per student what Lutheran day schools spend, and NAIS boarding schools spend about three times what Lutheran day schools spend. While this residual or unexplained effect is large, it is much smaller than the observed ratio of raw NAIS and LCHS per-pupil expenditures. NAIS day schools spend about four times what Lutheran schools spend per student, and NAIS boarding schools spend about eight times what Lutheran schools spend. (See Table 3.)

We began the study with the hope that models based on measured school characteristics might be used to impute per-pupil expenditures for sectors of private education for which we currently lack data. In order to use the models we have developed to impute per-pupil expenditures for other sectors of private education, it would be necessary to decide whether to rely on model estimates for Lutheran day, NAIS day, or NAIS boarding schools. Based on

informal discussions with representatives of major associations of private schools, we believe that imputed values based on the model results for Lutheran schools are likely to provide reasonable estimates of per-pupil expenditures for many religious and non-sectarian private schools, but this assumption cannot be checked with the data available. In this respect, then, the results we have obtained are disappointing.

On the other hand, the models are, in other ways, quite striking. The parameter estimates for the three sectors for which we have data are generally quite similar, despite the clear differences in organization and per-pupil expenditures among schools in the three sectors. This suggests that much might be learned by exploring models of the kind we have developed more fully.

In particular, we believe much could be learned by estimating similar models for a wider range of private schools. Unfortunately, few associations currently collect data of the kind collected by the LCMS and NAIS. But if data from additional associations could be identified, the data would provide an excellent opportunity to replicate the work here. Alternatively, the analyses we have conducted might be replicated using the 1993-94 SASS (along with the LCMS and NAIS expenditure data we have already collected and linked to the PSS). Since the 1993-94 and 1990-91 SASS samples have relatively few schools in common, this would provide a nearly independent random subsample of LCMS and NAIS schools, offering an opportunity to examine the stability of our parameter estimates.

Apart from replicating the work reported here with new data, it may also be worth conducting additional analyses of the current sample of schools, focusing on additional school characteristics. Such analyses might cast further light on the determinants of private school spending. In the work reported here, we focused primarily on school characteristics that can be viewed as direct components of spending (such as teacher and administrator salaries and the

teacher-student ratio). It may also be useful to focus on a broader range of characteristics that might be viewed as factors that influence spending. Such factors might, for example, include school selectivity (i.e., the percent of applicants accepted) or the age of the school. In addition, region or urbanicity may have an influence on spending over and above whatever influence they have on staff salaries and staffing patterns, which are already reflected in the model. Both region and urbanicity may influence costs, for example, by influencing the utilities budget, or as a proxy for regional norms and competitive pressures.

In addition, our work suggests that one especially fruitful line of work may involve collecting data on non-dollar measures of materials, supplies, and school facilities. The substantial effects of grade-level organization and coeducational status in our models, along with the residual differences between Lutheran day schools, NAIS day schools, and NAIS boarding schools after controlling for salaries and staffing, suggests that materials, supplies, and facilities may be the most important components of spending for which we now lack data. It is possible that creative items to gather such data might be added to the SASS. For example, items might ask about the total square feet of space in school buildings or the total acres of land owned by the school. Items might also ask about computers and calculators, lab equipment, athletic facilities, and facilities in the arts and music. These non-financial items (like the current SASS items on non-teaching staff) may be fairly powerful predictors of spending on facilities, materials, and supplies.[24]

Overall, our work suggests that much can be learned about private school spending by asking directly about resources — such as staff, and, at least potentially, materials, equipment, and

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[24]In addition, our qualitative case studies of a number of private schools suggests that a few additional items might be helpful in predicting expenditures -- especially items asking about whether financial item is included as an expenditure item at the school, and whether non-routine maintenance is included as a regular operating expense. See Isaacs, Garet, and Sherman, 1996.

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facilities — rather than, or in addition to, asking about dollar expenditures. The powerful effects on per-pupil expenditures of the staffing variables in our models (including, in particular, the effects of support staff and maintenance staff per teacher) indicate that it may well be worth thinking about ways in which similar questions may be asked about other key school resources.

Finally, we conclude that, even with improved data on materials, supplies, and facilities, models of the sort estimated here are unlikely to provide satisfactory estimates of total national spending on private education. To develop valid national estimates, we believe, new data on expenditures must be collected from a national sample of private schools. A small set of items on a mailed questionnaire (perhaps including one item requesting total operating expenditures and a few clarifying questions) would provide the foundation for a basic estimate of total spending for the full population of private schools.[25] While the data that could be collected using a small set of items on a mailed questionnaire would not permit a detailed analysis of the components of expenditures (for example, the amounts spent on instruction or administration), such data would permit public-private comparisons of total per-pupil spending, as well as comparisons across sectors of private schools. In addition, such data would make it possible to estimate models similar to those reported here, examining the determinants of differences in spending across private schools.

While data on total expenditures for a national sample of schools (supplemented by appropriate clarifying questions) should substantially improve our understanding of private school spending, such data are probably best viewed as a first step, not as a complete answer to the need for data on private school expenditures. Eventually, we believe, more fine-grained data will be required on the major components of spending — including, for example, data on spending for

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[25] For a possible set of questions that might be added to the SASS, see Survey B in Isaacs, Garet, and Sherman, 1996.

instruction, administration, support services, and facilities. Without such data, it will remain difficult to specify with precision the kinds of expenditures included in and excluded from estimates of total spending, and it will remain difficult to draw firm conclusions about the meaning of public-private and cross-sector comparisons.

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Appendix A

The tables that follow report the results of models predicting various school characteristics, based on enrollment, enrollment squared, sector (NAIS day and NAIS boarding versus Lutheran day), and grade-level organization (secondary and combined versus elementary).

TABLE A1

Regression Estimates of the Effects of Enrollment, School Type, and Grade Level Organization on Teacher and Administrator Salaries and Teacher-Student Ratio

	Dependent Variable			
	Lowest Teacher Salary	Highest Teacher Salary	Principal Salary	Teachers per Ten Students
Intercept	15,450.***	26,344.***	30,899.***	0.497***
Enrollment	631.***	2,005.***	4,147.***	-.067***
Enrollment-squared	-24.**	-91.***	-191.***	.002**
NAIS day	2,756.***	6,827.***	26,736.***	.525***
NAIS boarding	135.	5,085.***	26,644.***	.734***
Secondary	-311.	1,596.	4,860.	.218***
Combined	-507.	617.	1,280.	.193***
R^2	.39	.41	.51	.60

+ p<.10, * p<.05, ** p<.01, *** p<.001

TABLE A2

Regression Estimates of the Effects of Enrollment, School Type, and Grade Level Organization on Non-Instructional Staff

	Dependent Variable				
	FT Administrators Per Teacher	FT Support Staff Per Teacher	FT Maint./Other Staff Per Teacher	FT Aides Per Teacher	PT Staff Per Teacher
Intercept	.079***	.004	.224***	.039**	.453***
Enrollment	-.009**	-.002	.027	-.002	-.035*
Enrollment-squared	.000+	-.000	-.003+	.000	.001
NAIS day	-.001	.131***	-.004	.011	-.171**
NAIS boarding	-.014	.181***	.527***	.038	-.086
Secondary	.016	.132***	.239*	-.286	-.096
Combined	.008	.041	.072	-.003	-.096
R^2	.07	.40	.23	.01	.19

+ p<.10, * p<.05, ** p<.01, *** p<.001

TABLE A3

Logit Estimates of the Effects of Enrollment, School Type, and Grade Level Organization on the Provision of Teacher Benefits

	Dependent Variable				
	Dental Insurance	Housing Assistance	Life Insurance	Meals	Medical Insurance
Intercept	2.406***	-1.194***	.062	-1.675***	3.721***
Enrollment	.097	.427**	.140	.205+	-.094
Enrollment-squared	.004	-.026**	.001	-.016*	.019
NAIS day	-2.721***	-1.806**	.812*	.939*	-1.412
NAIS boarding	-2.933***	2.214***	.933+	4.576***	-2.500+
Secondary	-.435	.734	-.067	-.109	1.802
Combined	-.166	-.348	-.020	-.065	1.591

+ p<.10, * p<.05, ** p<.01, *** p<.001

TABLE A4

Logit Estimates of the Effects of Enrollment, School Type, and Grade Level Organization on the Provision of Additional Teacher Benefits

	Dependent Variable			
	Pension	Scholarship for Children of Staff	Transportation Assistance	Tuition Assistance for Teachers
Intercept	2.901***	-.197	-1.554***	1.005***
Enrollment	.620*	-.125	.149	0.421***
Enrollment-squared	-.021	.001	-.009	-.022**
NAIS day	-.974	.848*	-.592	-.512
NAIS boarding	.028	1.037+	.532	.361
Secondary	.208	1.116*	-1.777*	.264
Combined	.309	1.830***	-1.274+	.146

+ p<.10, * p<.05, ** p<.01, *** p<.001

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